

REPORT OF
THE HEAVY ENGINEERING COMMITTEE
APPOINTED BY THE GOVERNMENT OF INDIA
TO EXAMINE THE REPORTS SUBMITTED BY
THE SOVIET TEAM AND THE U.K. MISSION
IN REGARD TO THE ESTABLISHMENT OF
HEAVY ENGINEERING INDUSTRY
IN INDIA.

C O N T E N T S

		<u>Page No.</u>	
Chapter	1	Introductory	1
Chapter	2	Consideration of technical data regarding approximate capital cost, annual output and number of employees, from the reports submitted by the Soviet Team of Heavy Machinery Experts and U.K. Heavy Engineering Mission.	5
Chapter	3	Deliberations of the Heavy Engineering Committee (assisted by Government officers) and recommendations.	9
Chapter	4	Procedure for the implementation of the Heavy Engineering Industry projects	23
		Acknowledg ment.	27

Enclsoure I		Requirements of Castings and Forgings for the Heavy Machine Shop and Medium/ Heavy Machine tool Works.	28
Enclosure II		Note submitted by Mr. Bhattacharji	29

Appendix A		Minutes of the meeting held on the 4th March, 1957, of the Committee appointed by Government to assess the reports submitted by the Soviet Team and U.K. Team in regard to the setting up of Heavy Engineering Industries.	34
Appendix B		Record note of the Second Meeting of the Committee appointed under the Chair- manship of Sir Jehangir Ghandy on Tuesday the 5th March, 1957.	44

Chapter 1.

INTRODUCTORY

At the invitation of the Government of India, the Soviet Team of Heavy Machinery Experts submitted its report in January, 1957, on the establishment of Heavy Machine Building Plant in India.

2. Likewise, the United Kingdom Heavy Engineering Mission appointed under the joint aegis of the Colombo Plan and the Federation of the British Industries, to advise the Government of India on the establishment of Heavy Engineering Industry, submitted its report, also in January, 1957.

3. The Soviet Team submitted subsequently a report to the Government on the establishment of a Coal Mining Machinery plant. The U.K. delegation has dealt with this project in their original report.

4. The Government of India in the Ministry of Heavy Industries appointed the present Committee (called the 'Heavy Engineering Committee') to examine the two reports and to advise Government on the most suitable plan on the establishment of Heavy Engineering Industry in India. The following is the composition of the Heavy Engineering Committee:-

Sir Jehangir Ghandy, Director - Tata Industries
(Private) Ltd., (Chairman)

Mr. S. Moolgaokar, Director - Tata Industries
(Private) Ltd., (Member)

Mr. S.K. Nanavati, General Supdt., Tata Iron &
Steel Co. Ltd., (Member)

Mr. P. Mueller, Chief Engineer, Tata Iron &
Steel Co. Ltd., (Member)

Mr. F.C. Bhadwar, Director - Bird & Co. Ltd.,
(Member)

Mr. P. Bhattacharji, Burn & Co. Ltd., (Member)

Dr. M.D. Parekh, National Rayons (Member)

Mr. P.R. Ramakrishna, Ramkrishna Industries Ltd.
(Member)

5. The meeting of the above Heavy Engineering Committee was convened at New Delhi on the 4th and 5th March, 1957. Mr. Bhadwar was unable to attend the meetings due to ill-health. Dr. Parekh and Mr. Ramkrishna were also unable to attend the meetings

due to other preoccupation.

6. The Committee had its first meeting on Monday the 4th March at 3 P.M. On the morning of the 5th March, it met members of the Special Committee appointed by the Government of India to examine the Forge-Foundry Project, which is to be established under the auspices of the N.I.D.C. The object of this meeting was to acquaint the Special Committee of the requirements of castings and forgings for the Heavy Machine Shop project, which would be a part of the Heavy Engineering Industry to be established in India. Thereafter the Heavy Engineering Committee had another meeting in the afternoon of the 5th March.

7. To assist the Committee in its deliberations, the following Government officers were present at the above meetings:-

Mr. L.K. Jha, I.C.S., Secretary, Ministry of Heavy Industries.

Dr. A. Nagaraja Rao, Chief Industrial Adviser & Ex Officio Joint Secretary

Mr. N. Subrahmanyam, I.C.S., Joint Secretary.

Mr. Jang Bir Singh, Senior Industrial Adviser.

Dr. B.D. Kalelkar, Industrial Adviser (Engg).

Mr. K. Ramachandran, Addl. Member, Railway Board.

Mr. E.W. Issacs, Railway Board.

Mr. A.N. Lahiri, N.I.D.C.

Mr. Nanu, Ministry of Production.

Mr. S.C. Dey, Ministry of Production.

Mr. Bhatt, Ministry of Information & Broadcasting.

Mr. R.K. Gejji, Development Officer (Tools)

Mr. S.K. Sinha, Development Officer.

Mr. S.C. Nundy, Development Officer.

Mr. N. Krishnaswami, Development Officer.

8. The minutes of the above meetings held on the 4th and 5th of March, 1957 are attached as Appendices A & B.

Chapter 2

CONSIDERATION OF TECHNICAL DATA REGARDING APPROXIMATE CAPITAL COST, ANNUAL OUTPUT AND NUMBER OF EMPLOYEES FROM THEREPORTS SUBMITTED BY THE SOVIET TEAM OFHEAVY MACHINERY EXPERTS AND UNITED KINGDOM HEAVY ENGINEERING MISSION.

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9. The fundamental technical data of the Heavy Machine Building Plant as incorporated in Table XXII of the Russian Report is reproduced below:-

Items	Units	Heavy machine building plant		Forge-foundry shop	
		Stage I	Stage II	Stage I	Stage II
1	2	3	4	5	6

I Basic Data

1. Annual output of finished machinery.	Tons	45,000	80,000	10,000	15,000 *
2. Semi-finished products to be re-released elsewhere roughed out.	"	-	-	8,000	20,00 *
3. Semi-finished product to be re-released elsewhere not roughed out.	"	-	-	62,600	90,000 *
Total output		45,000	80,000	80,600	125,000
4. Total personnel including workers.	Persons	3,920 2,800	5,990 4,400	3,200 2,690	4,940 4,070
5. Total area of production shops.	m ²	44,700	80,000	82,250	102,500
6. Number of machine tools in production shops.	Units	278	475	33	51
7. Capital outlay.	Million Rupees Rs. Crores	186.1 (18.61)	266.8 (26.68)	246.7 (24.67)	365.0 (36.50)
8. Production per worker	tons/year	16.0	18.2	30.0	31.0
9. Capital outlay per one ton of output per year.	Rs.	4,100	3,350	3,080	2,920

*(At the first stage, the forge-foundry plant will supply out of the total output 3,000 tons of rolls, for rolling equipment 1,500 tons of roughed semi-finished products and 77,200 tons of unroughed semi-finished products to the heavy machine building plant).

The estimates do not take in consideration the prices of land, levelling charges, training of personnel, housing, cultural and other social utility services and the preliminary operations cost

10. It will be observed that in the first stage 45,000 tons of finished machinery per year and in the second stage 80,000 tons of finished machinery per year, are expected to be produced in the Heavy Machine Building Plant.

11. However, in the Aide Memoir dated 20th February, 1957, submitted subsequently by the Soviet Team of Heavy Machinery Experts, it has considered the possibility of ^{the} establishment of Heavy Machine Building Plant for the manufacture of approximately 22,000 tons of finished machinery per year to begin with, instead of 45,000 tons in the first stage as indicated in their original report. This reduced capacity has been indicated by the Soviet Team at the request of Government of India.

12. In view of Government's decision to establish a separate Forge/Foundry Shop in India under the auspices of the N.I.D.C. this part of the project included in the Russian Report does not require further consideration.

13. Likewise, the fundamental technical data on the establishment of Heavy Engineering Industry in India, as obtained from Appendices 1 to 5 (pages 57 to 115) of the Report submitted by the United Kingdom Heavy Engineering Mission, are summarised on the following page.

Summary of proposed Works:

Description of Works.	No. of Units	Approx. Capital cost	Annual output				No. of employees (Incl. Apprentices)	
			One Shift operation		Two Shifts operation		Shift operation	Two shift-operation
			Tons	Valued at Rs. crores	Tons	Valued at Rs. crores		
Heavy Structural fabricating Works	1	1.09	10/12000	1.07	18/20000	1.00	188	305
Heavy Plate & Vessel fabricating Works	1	5.16	10/12000	2.35	18/20000	4.00	795	1345
Heavy Machine shop	1	3.31	Not recommended	-	Not indicated	3.31	-	660
Medium/Heavy M/c Tool Works	1	4.46	3500/4500	2.70/3.30	Not recommended	-	990	-
Finishing Machinery factory	1	2.96	Not recommended	-	Not indicated	2.70/3.30	-	1120
Total		16.98			39,500/44,500 plus ton-	14.71/15.91 (includes*)	4420 (includes*)	des@)

nage from	Average	- Say
Heavy M/c	15.31	4500
Shop and		
Mining		
Machinery		
Factory,		
which have		
not been		
indicated		
(includes+)		

** Capital cost of the projects exclude working capital, site purchase and all work outside the perimeter of the works (i.e. Town and cultural facilities, housing municipal services etc.)

14. It will thus be observed that if one unit of each of the Works proposed by the U.K. Mission is established, on the basis of two shift operation, the annual output would be 18/20000 tons from the Heavy Structural Fabricating Works, 18/20000 tons from the Heavy Plate & Vessel Fabricating Works, 3500/4500 tons of Medium/Heavy Machine Tools (one shift operation for this unit), plus finished machinery from the Heavy Machine Shop and Mining Machinery Factory the tonnages of which have not been indicated in the report.



Chapter 3

DELIBERATIONS OF THE HEAVY ENGINEERING
COMMITTEE (ASSISTED BY GOVT. OFFICERS)
AND RECOMMENDATIONS.

15. Mr. L.K. Jha in his opening remarks at the first meeting of the Committee outlined the genesis of the reports leading up to the appointment of the Committee. He then said that Government were anxious to obtain advice on the most desirable way of setting up Heavy Engineering Industry and a Coal Mining Machinery plant in the light of the Russian and British reports, and would appreciate the Committee's recommendations in this respect. He explained that the Government had deliberately refrained from laying down definite terms of reference so as not to tie down the Committee to any rigid terms; but emphasised that in view of financial limitations Government could only allocate about Rs. 40 crores at present for the whole scheme, including the Forge/Foundry Project but excluding cost of acquiring land, working capital, housing and town facilities etc. He mentioned that this sum would be available for expenditure during the Second 5-Year Plan period; but indicated that more funds could be expected to be available during the subsequent years.

16. Thus, the main assignment of the Committee was to indicate the nature of overall planning that was needed and to indicate further how the amount of Rs. 40 crores could best be utilised in the establishment of the Heavy Engineering Industry in India, during the Second 5-Year Plan. Mr. Jha stated that in view of the foreign exchange stringency it was the declared policy of the Government to obtain long term credits. Whilst the Russians had indicated possibilities of securing long term credits, no approach on the subject had been made to the British Team. However, this was a matter which could further be negotiated by the Government of India at the proper time.

17. In regards to the Forge-Foundry project, Mr. Jha stated that this project was contemplated much earlier to the Russian or to the British proposals. As a matter of fact, four tenders had been received by Government and these were being reviewed by a Special Committee set up for the purpose. Therefore, the Heavy Engineering Committee need not consider the Forge/Foundry project except to indicate to the Special Committee set up for this purpose, the

the requirements of castings and forgings in the establishment of Heavy Engineering Industry.

18. After considering the British and Russian reports the Heavy Engineering Committee was of the unanimous opinion that, for reasons stated below, the proposals contained in the report of the U.K. Heavy Engineering Mission were preferable to those submitted by the Soviet Team of Heavy Machinery Experts. These reasons are:-

- i) Whilst the Russian report recommends establishment of an integrated Heavy Machine Building Plant as a homogeneous unit, the British report recommends the establishment of different shops on unit basis. The U.K. report has, however, correctly pointed out that the Heavy Machine Shop should be located in close proximity to the Forge/Foundry project. With the exception of the Medium/Heavy Machine Tool Plant, which could be located near the same site, the other units, namely, the Plate & Vessel Works, the Heavy Structural Works and the Mining Machinery Factory could be located at independent sites.
- ii) The recommendations made by the U.K. Heavy Engineering Mission will permit a greater scope for ultimate development of the Heavy Engineering Industry than units of a composite plant sited at one location.
- iii) The British report covers a wider scope for, in addition to equipment for the Iron & Steel Works, they have envisaged production for other industries, such as chemical and fertilizer industries in a Plate and Vessel works. The British report also recommends the production of medium/heavy machine tools and of mining machinery in separate factories. These aspects have not been covered by the Russian report, who, however, submitted a later report on Mining Machinery production.
- iv) The establishment of the Heavy Engineering Industry on unit basis will enable return on investment to be earned earlier, as it would be possible to obtain production from separate units earlier than in the case of an integrated plant at one site.
- v) Dispersal of some of the units is advisable for strategic considerations and also for reasons of transport facilities.

vi) Concentration of Heavy Engineering Industry at one site as recommended in the Russian report may make it difficult to obtain highly skilled layout which is essential for this project. Dispersal of units, on the other hand, as recommended in the U.K. report, will enable generations of skilled labour to be developed more effectively.

19. In regard to the project for Heavy Machine Shop, the Soviet Team in its Aide Memoir dated 20th February, 1957, has indicated an approximate range of output of machinery and equipment as shown below:-

S.No.	Name of Machinery and Equipment	Weight (Tons)
1.	Coke Ovens Bye-Product equipment	5,000
2.	Blast Furnace equipment	4,000
3.	Steel Making equipment	5,000
4.	Crushing and Grinding equipment	2,000
5.	Cranes	4,000
6.	Assemblies of Rolling Mill equipment and spare parts.	2,000
		<u>22,000</u>

20. On the other hand, the U.K. Heavy Engineering Mission report has not indicated the tonnage or the expected range of output of machinery and equipment. Further, as indicated on page 55 of their report, if two Heavy Machine Shops are to be located, the investment involved is Rs.6.7 crores. The Soviet Team of Heavy Machinery Experts have indicated to Government that a Heavy Machine Building Plant in the range indicated above would cost approximately Rs. 7 crores. Therefore, as the capital investment indicated is approximately the same and, as we were given to understand, the Russians would offer satisfactory credit terms, the Committee is of the opinion that the Russian project for Heavy Machine Shop may be accepted.

21. In regards to the Mining Machinery Works, the U.K. report has provided for capital investment of Rs. 2.96 crores. This estimate is exclusive of Forge/Foundry Shop as they had assumed that the requirements of forgings and castings for this unit would be supplied from the Forge/Foundry Project to be established under the auspices of the N.I.D.C. However, this Committee considers that, within the financial limit of Rs. 20 crores provided for the Forge/Foundry project, it will

not be possible to provide for additional capacity to supply components to the Mining Machinery Works, in addition to the requirements of the Heavy Machine Shop and the Medium/Heavy Machine Tool Works. Therefore, a small Forge and Grey Iron Foundry will have to be integrated with the Mining Machinery Works to make it a composite unit. With this in view, the capital investment has been increased to approximately Rs.4.5 crores.

22. The Heavy Engineering Committee has been advised that the Soviet Team of Heavy Machinery Experts has recently submitted a more elaborate scheme for the manufacture of mining machinery in a separate Works, estimated to produce approximately 30,000 tons of machinery a year, involving a capital investment of approximately Rs. 13 crores. It is, therefore, suggested that the Soviet Team of Heavy Machinery Experts as well as the U.K. Heavy Engineering Mission should be asked by Government to re-examine and submit a revised project for the production of approximately 8/10,000 tons of mining machinery requiring a capital investment not exceeding Rs. 4.5 crores including its Forge/Foundry Shop. The requirements of mining machinery and other equipment to the tune of 8/10,000 tons a year should be worked out in detail by Government in consultation with the Coal Mining Industry, before requesting the Soviet Team and the U.K. Mission to re-examine this project.

23. The Committee recommends that the following shops and the number of units be accepted in the establishment of Heavy Engineering Industry in India, as a beginning.

<u>Works</u>	<u>No. of Units</u>	<u>Approximate Capital investment Rs. in Crores</u>
Forge/Foundry Shop	1	20.00
Heavy Machine Shop	1	7.00
Heavy Structural Works	1	1.09
Heavy Plate & Vessel Works	1	5.16
Medium/Heavy Machine Tool Works	1	4.70 *
Mining Machinery Works	1	4.50
Total		42.45
at 15% for contingency		6.37
Total including contingency		48.82 - say 49 crores

* Although in Appendix 4 of the U.K. report the estimated capital cost is shown at 4.46 crores, on page 55 of their report the figure has been

increased to 4.7 crores. Therefore, the higher figure is taken for calculation.

24. The Committee considers it essential to make a minimum provision of 15% on the estimated investment cost for contingencies. With prices of machinery and equipment on the increase, it is very likely that the actual expenditure to be incurred during the next four years of the Second 5-Year Plan will be higher than the estimates. The above estimates have been taken from the U.K. Mission report, except for the Heavy Machine Shop which has been recommended by the Committee on the pattern offered by the Russians at an estimated cost of approximately Rs. 7 crores.

25. The Committee wishes to point out that the capital investment has been indicated on broad outlines. When detail project reports are received, it is very likely that the capital investment may exceed the estimate indicated.

26. It will be observed that the total estimated investment including 15% for contingencies is approximately Rs. 49 crores and therefore, the financial limit of Rs. 40 crores as indicated by Government will not be sufficient.

27. The Committee recommends that if it becomes essential to eliminate some of the projects, then the following should be the order of priority.

- i) The first unit to be set up should be a composite unit comprising of Forge/Foundry Shop and a Heavy Machine Shop.
- ii) One unit of Plate and Vessel Works.
- iii) One unit of Heavy Structural Works.
- iv) One unit for the production of Mining Machinery and equipment.
- v) One unit for the production of Medium/Heavy Machine Tools (to which should be attached the heavy grey iron section of the N.I.D.C. Forge/Foundry project).

28.. One member of the Committee, Mr. P. Bhattacharji, suggested a combination of units to be established for the Heavy Engineering Industry, different to what has been indicated in paragraph 23. A separate note has been submitted by Mr. Bhattacharji, which is attached as Enclosure II. It will be observed, according to his proposals, that the estimate for capital investment, including 15% for contingencies, works out to approximately Rs. 51 crores.

29. It was the considered opinion of the other members of the Heavy Engineering Committee as well as of the Government officers who were present that early establishment of a Machine

Tool Works is essential for providing a broad enough base for the development of Heavy Engineering Industry. In addition, the Committee also felt that Mr. Bhattacharji's proposals would result in a larger number of men to be employed which will further increase the total capital investment to provide for housing and other municipal services for the additional number. Mr. Bhattacharji said that he wished his point of view to be brought before the Government and a separate note from him is therefore attached as Enclosure II.

FORGE/FOUNDRY PROJECT - N.I.D.C.

30. As stated previously, Government have appointed a Special Committee to examine the different proposals received for the establishment of a separate Forge/Foundry project under the auspices of the N.I.D.C. At the meeting on the 5th March, 1957, the Heavy Engineering Committee have indicated the requirements of forgings and castings for the Heavy Machine Shop and for the Medium/Heavy Machine Tool Works. The details of requirements have been indicated in Enclosure I attached with this report.

31. The following is a summary of the requirements:-

(a) Steel Castings.

Finish-machined requirement	-	13,500 tons per annum			
Fettled & cleaned casting required for above.	-	18,000	"	"	"
Liquid metal reqd. for above	.	26,000	"	"	"

(b) Forging.

Finish machined forgings reqd.	10,000	"	"	"
Ingots reqd. for above	20,000	"	"	"
Liquid metal reqd. for above	24,000	"	"	"

(c) Total liquid metal capacity required for steel	50,000	"	"	"
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(d) Grey Iron Casting.

Finish-machined casting reqd.	6,000	"	"	"
Liquid metal capacity reqd. for above.	10,000	"	"	"

The above tonnages are exclusive of the requirements of rolls for the steel plants.

32. The Heavy Engineering Committee also recommends, finance permitting, that a section for manufacture of non-ferrous components be included in the Forge/Foundry project with a capacity of approximately 1500 to 2000 tons per annum of finished non-ferrous components.

33. As will be observed from Enclosure I, the total requirement of Heavy Machine Shop has been broadly divided into 40% forgings and 60% steel castings. Likewise, for

the Medium/Heavy Machine Tool Works, it has been estimated that the requirement of forgings will be 33% and that of grey iron castings will be 67%.

34. The Special Committee appointed by Government to examine the Forge/Foundry project was of the opinion that the load for the grey iron foundry is not sufficient and, on the other hand, the forge shop appeared to be overloaded. Therefore, the Heavy Engineering Committee recommends that the allocation of castings and forgings for Heavy Machine Shop and the Medium/Heavy Machine Tool Works, as indicated in Enclosure I, be referred to the Soviet Team of Heavy Machinery Experts as well as to the U.K. Mission. This is suggested as the Heavy Machine Shop as offered by the Russians and the Medium/Heavy Machine Tool Works as offered by U.K. Mission, have been recommended by the Committee for acceptance. If any adjustments are necessary in the quantities of castings and forgings, then the revised figures should be indicated by Government to the Forge/Foundry Special Committee for their consideration.

35. In Enclosure I, requirements have been indicated for finished and machined castings and forgings. To avoid any duplication of machine tools in the Forge/Foundry project and in the Heavy Machine Building and Medium/Heavy Machine Tool Works, the details of machine tools should be carefully checked by the Special Committee, preferably in consultation with the Soviet Team and U.K. Mission.

36. In the event of the Medium/Heavy Machine Tool Works being established at a site other than for Forge/Foundry project and Heavy Machine Shop, the Committee recommends that the Grey Iron Foundry should be isolated from the Forge/Foundry project and should be integrated with the Machine Tool Works, as the requirements of grey iron castings are mainly for this shop.

Chapter 4

PROCEDURE FOR THE IMPLEMENTATION OF
THE HEAVY ENGINEERING INDUSTRY PROJECTS.

37. The Heavy Engineering Committee suggests that if its recommendations incorporated in Chapter, 3, are accepted by Government, following should be the procedure for its implementation.

38. In regard to the establishment of Heavy Machine Shop, as offered by the Soviet Team of Heavy Machinery Experts in their Aide Memoir dated 20th February, 1957, they should be asked to submit a detail project report. This report should be examined by a Committee of specialists to be appointed by the Government in consultation with established Engineering concerns.

39. In regard to the Mining Machinery Works, when the revised project is submitted by the Soviet Team of Heavy Machinery Experts and the U.K. Heavy Engineering Mission, on the lines indicated in paragraph 22 of this report, it should be examined by a Committee of specialists to be appointed by the Government in consultation with the Coal Mining Industry. If the revised proposals submitted by the U.K. Mission is accepted then tenders on a global basis should be invited and examined by the same Committee.

40. As regards the establishment of other shops, namely, Plate and Vessel Shop and Structural Shop, it is suggested that either the representatives of the U.K. Mission or of the Federation of British Industries, be approached to work out detailed specifications in consultation with Indian specialists to be appointed by Government on the basis of which tenders should be invited on a global basis. These tenders when received should be examined by a Committee of specialists to be appointed by the Government in consultation with established Engineering concerns.

41. In regard to the Medium/Heavy Machine Tool Manufacturing Works, it is suggested that reputable firms like Wagners, Waldrich etc. should be asked to submit a detail project report. These reports could then be examined by a Committee of specialists to be appointed by the Government.

LOCATION AND SUPPORTING SERVICES.

42. If the Government accepts the recommendation of the Heavy Engineering Committee, it is suggested that a small Committee be appointed with equal number of representatives

from Government and from the existing Heavy Engineering Industry to study the site location. The report submitted by the Soviet Team of Heavy Machinery Experts contains useful information in regard to some sites.

43. In regard to the supporting facilities and other services, Government should examine the various points indicated in the U.K. Heavy Engineering Mission report on pages 39 and 40.

TRAINING

44. The training programme for the establishment of Heavy Engineering Industry on the scale now contemplated by Government must receive very careful consideration. It has to be remembered that Heavy Engineering Industry requires a very high percentage of technical staff and skilled labour. In both the reports submitted by Soviet Team of Heavy Machinery Experts and the U.K. Heavy Engineering Mission, useful suggestions have been made in regard to the training programme. The success and time table of the schemes will depend a great deal on the training facilities. To set up six new units in a country short of technical skill is a very big task. Existing organisations cannot spare key men for new projects. Some sections will require highly skilled workers, such as jig, die and tool designers and tool room skilled men, pattern makers etc., where a long training and experience is necessary. The alternative is for a long period to utilise foreign specialists. This means it is essential to implement the training scheme at an early date, so as to have available some trained Indian supervisors and workers by the time the plants are installed.

45. It is, therefore, recommended that a Special Committee be appointed by Government as soon as a decision is reached for the establishment of Heavy Engineering Industry on the scale now proposed, to draw up a detailed training programme, in consultation with the established Engineering concerns.

46. The Heavy Engineering Committee wishes to place on record the very valuable help received from all Government officers and particularly from Mr. L.K.Jha, Secretary, Ministry of Heavy Industries.

(Sd) Jehangir Ghandy

(Sd) S. Moolgaokar

(Sd) P. Bhattacharji

(Sd) S.K. Nanavati

(Sd) P. Mueller

Dated 18th March, 1957.

REQUIREMENTS OF CASTINGS AND FORGINGS FOR
THE HEAVY MACHINE SHOP & MEDIUM/HEAVY MACHINE TOOL WORKS

Heavy Machine Shop
22,000 tons p.a. output of machinery and equipment.
Allowing approx. 2000 tons for manufacture of steel structures, assumed that finished machinery and equipment will require 20,000 tons per annum of finished castings and forgings:-

Medium/Heavy Machine Tool Mfg., Works.
4500 Tons of
Machine Tools p.a.

20,000 Tons p.a.

Finished & Machined Castings (Steel)	Finished & Machined Forgings	Finished & Machined Forgings	Finished & Machined Grey Iron Castings
12,000 tons	8,000 tons	1,500 tons	3,000 tons
(@ 75% yield)	(@ 50% yield)	(@ 50% yield)	(@ 75% yield)
16,000 tons cleaned castings	16,000 tons ingots.	3,000 tons ingots	4,000 tons Grey Iron castings
(@ 70% yield)	(@ 80% yield)	(@ 80% yield)	(@ 80% yield)
23,000 tons Liquid metal	20,000 tons liquid metal	4,000 tons liquid metal	5,000 tons of liquid metal (Grey Iron)

47,000 Tons p.a.

steel making capacity-say 50,000 tons p.a. allowing for additional capacity for approx. 1500 tons castings for other uses.

Making allowance for additional 3000 tons Heavy Grey Iron castings which may be required either by the Heavy Machine Shop or for other uses, the iron manufacturing capacity (Grey Iron) should be provided for 10,000 tons per annum, which would yield approximately 6,000 tons per annum of Grey Iron Castings.

Summary:

- Steel making capacity - 50,000 tons p.a. (includes 24,000 tons for ingots)
 - Finished & machined steel castings - (12,000 + 1,500) - 13,500 tons p.a.
 - Steel Castings (cleaned) - 18,000 tons p.a. (16,000 + 2,000)
 - Ingots for forging - 19,000 tons p.a. - Say 20,000 tons to give 10,000 tons finished forgings.
 - Grey iron making capacity - 10,000 tons p.a. to yield
 - 6,000 tons finished and machined Grey Iron castings.
- A) The above is exclusive of requirements for Roll Foundry.
B) Also provide for non-ferrous foundry for production of 1500/200 tons p.a. of finished components.

ENCLOSURE II

Note submitted by Mr. Bhattacharji (member)

This note is in amplification of my proposal as given in paras 28 and 29 of the Report.

There are two major obstacles to our rapid industrialisation. The first is the limitation of funds available, mainly in regard to foreign exchange. This situation is not likely to improve for a considerable time to come if our horizon remains as vast as at present. We should, therefore, consider allocation of priority to units which would fetch the maximum return for their investment and save the maximum foreign exchange. According to the British report the Plate & Vessel shop would give an output of Rs. 4 crores (in double shift) and would produce per year its own range of plant one "Sindri" or one 1-million ton steel Works up to pre-ingot stage. During the 3rd Plan period Government's target is to set up 9 million tons of additional steel capacity and 6 "Sindriss" i.e., a total of 15 units for the Plate & Vessel Shop. With one Plate & Vessel Shop only 5 units can be manufactured during the 3rd Five Year Plan leaving 10 units to be imported. With 2 such shops only 5 units will require to be imported. Also the saving in foreign exchange by having an extra shop will be Rs. 4 crores per year for an additional capital outlay of Rs. 5 crores. Moreover, these plants are bulky and the freight is excessive. As for the Heavy Structural Shop an additional Bay would require only an extra outlay of Rs. 0.7 crores giving an output of 2 crores per year. The establishment of these extra units would also ensure an outlet for the plates to be produced at the Rourkela Plant. The output of the Medium/Heavy Machine Tool Shop on the other hand, when fully established would be about 3 crores, the capital outlay being Rs. 4.7 crores. Thus two units each of Heavy Structural and Plate & Vessel Works in preference to the Machine Tool Shop would give an extra output of Rs. 3 crores per year, apart from other advantages.

Our second major obstacle is shortage of trained personnel. I consider this aspect to be of first importance for any of our future planning. For whilst we might set up factories by obtaining expert advice and allocating necessary funds, they would remain ineffective until suitable trained personnel is available. It is well known that Machine Tool Industry takes a very long time to get established. We already have 2 Machine Tool Factories (Light) in the public sector. These have yet to develop suitable

varieties of machine tools of adequate quality. To my mind these existing units should be our source for trained personnel for the proposed Heavy Machine Tool Shop; but it would not be prudent to deplete these factories before they are fully established and can spare men. I do not visualize reaching this stage in less than 5/6 years. On the other hand Structural Industry is already established in the country and trained personnel would not be so difficult to get if training of ~~extra men~~ is commenced now in the existing workshops. I, therefore, feel that the Medium/Heavy Machine Tool Shop should be undertaken after 3/4 years. According to the British Mission it would take about $3\frac{1}{2}$ /4 years to complete i.e., it would be ready in about 7/8 years when trained personnel with experience of various types of machine tools should be available for mining the factory. It is realised that a Heavy Machine Tool Shop is a strategic necessity but without proper personnel its very purpose would be defeated.

As the proposed Grey Iron Foundry would mainly cater for the Medium/Heavy Machine Tool Shop this portion of the Forge/Foundry project should be set up only when the Machine Tool Shop is taken on hand.

The order of priority which I would recommend would therefore be:-

	Capital investment (including 15% contingency) in crores of Rs.
(1) 1 Unit of Forge/Foundry Shop excluding Grey Iron Foundry	- 15.80
(2) 1 unit of Heavy Machine Shop	- 8.04
(3) " " " Heavy Plate & Vessel Works	- 5.93
(4) " " " Heavy Structural Works	- 1.26
(5) " " " Mining Machinery Works	- 5.17
(6) 2nd " " Heavy Plate & Vessel Works	- 5.93
(7) " " " Heavy Structural Works	- 0.80
(8) 1 " " Grey Iron Foundry	- 2.70
(9) 1 " " Medium/Heavy Machine Tool Works.	- 5.41

	51.04 crores

N.B. For the Heavy Machine Shop the cost has been taken as per the Russian Report which has been recommended by the Committee.

Items 1 and 8 are based on the tender submitted by M/s Technoexport of Czechoslovakia whose total price for

the project is Rs. 16 crores .out of which Rs. 2.3 crores is for the Grey Iron Foundry. The Steel melting equipment provided in the tender would be more than adequate for 50,000 tons of liquid carbon steel per year.

(Sd.) P. Bhattacharji

Dated 12th March, 1957.



APPENDIX A

Minutes of meeting held on 4th March, 1957
of the Committee appointed by Government to
assess the reports submitted by the Soviet
Team and U.K. Team in regard to the setting
up of Heavy Engineering Industries.

Present:-

Sir Jehangir Ghandy (Chairman)

Mr. S. Moolgaokar, Tata Industries Private Ltd. (Member)

Mr. P. Bhattacharji, Indian Iron & Steel Co. (Member)

Mr. S.K. Nanavati, Tata Iron & Steel Co. (Member)

Mr. P. Muller, Tata Iron & Steel Co. (Member)

Government officers also present:

Mr. L.K. Jha, I.C.S., Secretary, Ministry of Heavy
Industries.

Dr. A. Nagaraja Rao, Chief Industrial Adviser & Ex
Officio Joint Secretary.

Mr. N. Subrahmanyam, I.C.S., Joint Secretary

Mr. Jang Bir Singh, Senior Industrial Adviser.

Dr. B.D. Kalelkar, Industrial Adviser (Engg)

Mr. Ramachandran, Addl. Member, Railway Board.

Mr. Issac of the Railway Board.

Mr. Lahiri, N.I.D.C.

Mr. Nanu, Ministry of Production.

Mr. S.C. Dey, Ministry of Production.

Mr. Bhatt, Ministry of Information and Broadcasting.

Mr. R.K. Gejji, Development Officer (Tools)

Mr. S.K. Sinha, Development Officer.

Mr. N. Krishnaswami, Development Officer.

Sri Jha welcomed the Chairman and members of the
Committee and outlined the genesis of the two reports to
be considered by the Committee. Mr. Mikoyan the Deputy
Soviet Prime Minister during his visit to India was
requested by the then Commerce & Industry Minister to
assist the Government in setting up facilities for the
production of heavy plant and machinery. The Soviet Team

of Heavy Machinery experts after their visit have submitted a detailed report, wherein they recommend the setting up of a composite plant for the production of heavy items of plant and equipment.

The Federation of British Industries under the joint auspices of the Colombo Plan sent out a team of U.K. experts to study conditions at first hand with a view to formulating proposals for the indigenous production of heavy machinery and equipment.

M. Jha stated that he was not in a position to give this Committee definite assignments, but stated that Government would appreciate it greatly if the Committee would recommend how best Government should spend the amount of 40 crores which would be available in the second Five Year Plan for setting up the requisite facilities for the production of heavy engineering items of plant and equipment, which would be needed during the 3rd Plan period and onwards. The amount of Rs. 40 crores indicated by Mr. Jha excluded amounts needed for working capital, housing colony and cost of land for the factory sites. He stated that this sum of Rs. 40 crores would be available during the next four years, but indicated that it would be reasonable to expect that more funds would be available during subsequent years. Thus the major assignment of the Committee was to indicate the nature of the over-all planning that was needed and to indicate further how this 40 crores could best be spend. Mr. Jha stated that the N.I.D.C. who had previously contemplated the setting up of a Heavy Foundry Project had already received four proposals.

Sri. Jha went on to say that the foundry forge project was contemplated much earlier to the Russian or the British proposals. Four detailed proposals have now been received and were being reviewed by a special

Committee set up for the purpose. It was estimated that approximately Rs. 20 crores would be required for this project. This would leave a balance of Rs. 20 crores for the balance of the projects that would need to be set up. Whilst the Russian report recommends the establishment in stages of a huge integrated plant, the British report appeared to have a wider scope for in addition to equipment for iron and steel works, they also envisaged the production in a separate plate and vessel works of plant for other industries such as chemical and fertiliser industries. They also recommended the production of heavy machine tools and mining machinery.

Sri. Jha requested the Committee to make recommendations in regard to the best manner of implementing these projects. Whether consultants should be asked to do the work or whether a package deal should be considered. Sri Jha stated that in view of foreign exchange stringency it was the declared policy of the Government to obtain long term credits. Whilst the Russian had indicated possibilities of securing long term credits the British had not touched upon this subject.

Sir Jehangir assured Mr. Jha that the Committee would endeavour to frame realistic proposals with a view to assisting Government to set up the requisite manufacturing facilities. He was of the view that the British proposal appeared more flexible than the Russian proposal of concentrating production activities at one centre.

Having regard to conditions in our country, the British proposal appeared to more suitable. He then invited the comments of the Members of the Committee and the Government officials.

Sri Moolgaokar stated that the main function of the Committee was to frame an overall picture of what needed to be done so that the desired results would be achieved in

the best possible manner. In view of the financial limitations that were imposed some order of priority would need to be imposed.

He was emphatically of the view that concentration at one centre should be avoided. It would be unwise to lay all our eggs in one basket. His instincts and experience indicated that it would be best to proceed along the lines recommended by the U.K. report. In his opinion, the first unit to be set up should be a composite unit comprising a heavy machine shop, a heavy steel foundry and a heavy forge shop. The second unit to be set up in a separate location should be a plate and vessel shop conceived in such a manner that in 6 to 10 years time it would be suitably manned and equipped to produce not merely normal lines of production but to produce heavy items such as heat exchangers and other vessels needed for nuclear energy development, for which plans, he felt, should be laid even at this stage. The third item should be a factory for the production of mining equipment. But it should be set up with its own captive foundry and forge shop as it was technically desirable that such a unit should be complete in these respects. The fourth priority should be given to the setting up of the factory for the heavy machine tools, to which should be attached a heavy machine tools, to which should be attached a heavy grey iron foundry. He enumerated the advantages of doing this. The first unit to be set up at suitable location should be a heavy structural shop as recommended by the British Mission. There was nothing particularly complicated about setting up such a unit.

Sri Nanavati whilst generally agreeing with Sri. Moolgaokar suggested that the order of priority should be somewhat different.

- (1) Plate and vessel work
- (2) Heavy structural shop
- (3) Foundry, forge and machine shop
- (4) Heavy machine tool shop.
- (5) Mining equipment.

The reason advocated by him was that a start should be made with items which are easy to manufacture so that there is quick return on the investment. From this angle, plate and vessel unit and heavy structural shop should therefore assume higher order of priority. He was also of the view that the British proposals are more flexible and should be adopted. According to him, if one unit each of a plate and vessel works, heavy structural shop, heavy machine tool shop and a unit for the production of mining machinery are established, this will take away only Rs. 17 crores leaving a balance of Rs. 23 crores, exclusively for the foundry forge project. He was therefore of the opinion that all the projects outline in the British Mission Report together with a suitable steel foundry forge shop could be accommodated within the financial limitations previously set out.

Mr. Muller generally agreed with Mr. Nanavati's views. A further argument advanced was that as the capacity for finished steel reaches 4.5 million tons per year by the end of the Second Five Year Plan, more structural fabricating units would have to be set up. A start should now be made so that the country is not faced with a situation where there is not adequate consumption of the increased quantity of steel that will be produced. He was of the opinion that the foundry forge project should also make a start simultaneously as such a unit takes a long time to go into production and fructify.

Dr. Kalelkar stated that he agreed by and large with the views expressed by Mr. Moolgaokar. It would be desirable

to lay out individual units in a manner that would permit expansion no sooner this became necessary. In the order of preference, he felt that the foundry, forge and heavy machine shop should be given the first place.

Dr. A. Nagaraja Rao made a detailed examination of the pros and cons of the Russian Report vis-a-vis the British Report. Whilst concentration in one centre is not advocated for various reasons the advantages accruing out of such concentration should not also be ignored. For instance, locating cast iron and cast steel foundry in one place will avoid lot of duplication in pattern shop and such other common work connected with the foundries. It would also be more economical to prepare site for erection of the factory in one large area rather than prepare the site in several places. Facilities such as power, transport, movement of raw material and semi-finished material from one shop to another would be more readily available if the various shops were concentrated at one place.

A further important factor would be the ease of organising a central design office catering to the need of the various shops.

As against this, dispersal of the various units has other advantages. It will be easier to train personnel for smaller units and the scope for expansion would be greater.

It was, therefore, his considered opinion that the pros and cons stated above would have to be very carefully considered before any conclusions are drawn. He sheared the views previously expressed that all the units should not be placed in one centre. He felt that instead of 5 different units proposed by the British, we could have 3 composite units.

It would be advantageous also to site the units in areas where facilities for land, water and power are

already available, so that the cost of creating such facilities are not reflected in the capital cost of the individual projects.

Sri. Ramachandran generally agreed with the views expressed by Sri. Moolgaokar. The Foundry forge and machine shop should be established first. He indicated that it would be desirable to stagger the construction programme of the various units because if a simultaneous start were made, the projects might not be completed in the requisite time. Sri Jang Bir Singh reiterated the views of Dr. A. Nagaraja Rao and suggested that the pros and cons stated by Dr. Rao would need to be studied very carefully. He felt that the location of the grey iron and steel foundries in one place would avoid duplication of pattern making and make scrap collection easier. According to him the foundry forge and machine shop would have to be close to each other. A close integration of the vessel and plate shop with the structural shop is necessary to get the finished products. This is obvious because the vessels fabricated in the vessel and plate shop would require supporting structures and hence the necessity to have some structural capacity in the plate and vessel shop also.

The mining machinery according to him could be located conveniently near the coal bearing area. Reiterating the need to establish and organise a design office immediately, Sri Jang Bir Singh said that three design offices, one close to the foundry, forge, machine shop, one in the plate and vessel shop and one in the factory proposed for manufacture of mining machinery would be absolutely necessary if the desired results were to be achieved. In the initial stages it may be possible to secure designs but before long we would need to be self-sufficient in regard to having adequate design facilities.

The trend of the discussion revealed that the consensus

of opinion was that concentration at one place as suggested by the Russians was not desirable. The approach suggested by the British team was preferable, subject to such modifications as were indicated as a result of the discussions.

Inquiries made by the Chairman revealed that the Russians would be prepared to assist the setting up of a suitable machine shop adjacent to the steel foundry and forge project.

The committee accepted the invitation of Sri. Jha to attend next morning the meeting of the committee that has been set up to consider all aspects of the heavy foundry and forge projects.

It was decided that a meeting of the Committee be held at 3 P.M. on the 5th March, 1957.



Record Note of the Second Meeting of the Committee appointed
under the Chairmanship of Sir Jehangir Chandy on Tuesday
the 5th March, 1957, at 3 p.m.

Present

Sir Jehangir Chandy (Chairman)
Mr.S.Moolgaokar, Tata Industries (Private) Ltd., (Member)
Mr.P.Bhattacharyya, Indian Iron & Steel Co. (Member)
Mr.S.K.Nanavati, Tata Iron & Steel Co., (Member)
Mr.P.Mueller, Tata Iron & Steel Co. (Member)

Government officers present

Mr.L.K.Jha, I.C.S., Secretary, Ministry of Heavy Industries.
Mr.N.Subrahmanyam, I.C.S., Joint Secretary
Mr.Jang Bir Singh, Senior Industrial Adviser
Dr.B.D.Kalelkar, Industrial Adviser (Engg)
Mr.Nanu, Ministry of Production
Mr.S.C.Dey, Ministry of Production.
Mr.S.K.Sinha, Development Officer.
Mr.S.C.Nundy, Development Officer.
Mr.N.Krishnaswami, Development Officer.

Continuing the proceedings left over in the earlier meeting, the Chairman read out a letter from Mr.Bhadwar of Messrs. Bird & Co., conveying his apology for not having been able to attend the meeting. He had however conveyed the view in his letter that the British Report was more flexible than the Russian one.

The Chairman drew the attention of the Committee to the proposed investment of Rs. 2.96 crores in the British Report for the manufacture of mining machinery, which excluded the foundry-forge shop. The scope of the proposed forge-foundry project under I.I.D.C., also excludes supply of castings and forgings to the plant intending to manufacture mining machinery.

The general opinion was that most of the foundries and forge shops in the country are fully loaded with orders and therefore, it was considered essential to set up a small foundry-forge shop,

as an integral part of the proposed plant to undertake manufacture of mining machinery. Mr. Mueller was of the opinion that many of the castings required for the mining machinery would be of special alloy cast iron and therefore existing foundries in India would find it difficult to supply the same. Mr. Moolgaokar was of the opinion that as far as possible the mining machinery plant should be self contained and should not depend on outside source for castings and forgings. The integration of the efforts of outside shops with that of the proposed mining machinery shop would be difficult. The Chairman, therefore, stated that the investment of Rs. 2.96 crores as proposed in the British Report would be inadequate for the purpose and the level of investment will have to be increased to 4.5 crores, to include a small integrated foundry forge plant to satisfy the needs of the mining machinery plant. This view was also supported by Mr. Dey of the Ministry of Production.

On the question of selection of the various projects, for establishing Heavy Engineering Industry in India, Mr. Bhattacharya was of the opinion that the schemes to be recommended would depend very much upon the financial limit prescribed, the return that would be expected from such projects and the extent to which foreign exchange would be saved as a result of installation of such units. The last one by far, in his opinion, was most important aspect and bearing that in mind, it would be better to leave out heavy machine tool manufacturing plant completely and concentrate instead, with the funds available, on installation of two structural shops, two plate and vessel shops and 2 machine shops. As stated in the British Report, he emphasised that this combination of the projects, could produce the relevant heavy plant for say, the equipment of 6 new "Sindries" and 4 new steel works each of one million tons capacity. Another reason advocated by him to cut out heavy machine tool shop was that the investment of the heavy machine tool shop proposed in the British Report is of the order of 4.7 crores and the annual outturn is estimated to be only 3.3 crores.

After lengthy discussion, the general consensus of opinion was that in order to make the country advance industrially, it was absolutely necessary to make a start with establishment of one heavy/medium machine tool plant and not leave it out. This is essential to expand the Heavy Machine Shop at a future date. Mr. Nanavati pointed out that if 2 units of each of the plants were installed, as suggested by Mr. Bhattacharya, the total number of men employed would be much higher and, when cost of township and other cultural facilities to be provided are taken into account, the total capital layout will be much higher.

Mr. Jha felt that if the financial limit of 40 crores, is increased by probably another 5 crores, it would make the task of the Committee easier, as this would enable some provision for contingencies to be made. The Committee was in agreement with this statement. Mr. Jha requested the Committee to select specific projects with which we could make a start to establish Heavy Engineering Industry and stated that if the Committee felt that a little higher allocation would be necessary, they could certainly make suitable recommendations to that effect to the Government. In doing so, he requested the Committee to indicate the level of investment for each project so that the Government would be able to appreciate the extent to which the investment level will have to be increased.

After mature consideration, the Committee came to an unanimous agreement to make a start with the following projects, taking in consideration that the N.I.D.C. foundry-forge project would absorb approximately Rs.20 crores by way of investment.

Sl. No.	Description of the project.	Investment in crores of rupees (Approx)	Remarks
1.	Forge-Foundry Project	20.00	For N.I.D.C. Project
2.	One Heavy Structural shop	1.09	U.K. Mission Report

Sl. No.	Description of the project.	Investment in crores of rupees (Approx)	Remarks
3.	One Heavy Plate and Vessel Shop.	5.16	U.K. Mission Report
4.	One Medium/Heavy machine tool shop.	4.70	-do-
5.	One Mining Machinery shop	4.50	(Inclusive of integrated foundry forge. The original level of investment prescribed in the U.K. Report was 2.96 crores excluding foundry forge).
6.	One Heavy Building Machine Shop	7.00	The Committee generally accepted that the heavy machine building shop should be on the pattern outlined in the Russian Report for which, excluding the foundry and forge, they had estimated a level of investment of Rs. 7 crores for an output of 22,000 tons annually.
Total		Rs. 42.45	Crores.

Allowing Rs. 6.37 crores at 15% for contingency the gross total investment works out to approximately Rs. 48.82 crores, if the above proposals are accepted by the Government - say Rs. 49 crores. This capital investment does not include procurement cost for land, township, housing and other cultural facilities or working capital.

The Heavy Engineering Committee agreed that if its recommendations are accepted by Government, following should be the procedure for the implementation of the different projects:-

a) Regarding the foundry-forge project, Mr. Jha stated that four proposals had been received already which were being considered by the Special Committee. When the Special Committee submits its recommendations, Government would consider getting a detailed project report from one of these four parties and this could then be examined again by the same Committee.

b) In regard to the heavy machine building shop, as agreed to earlier by the Committee the Russians may be asked to prepare a detailed project report since they have already made a fairly detailed study. This project report could then be examined by a Committee of Technical Experts from the private industries and Government. It was also made known to the Committee by Sri Jha that even if the foundry-forge is excluded from the Russian project report, they would still be inclined to set up a heavy machine building shop with an estimated investment of 7 crores for an initial annual output of 22,000 tons of finished equipment.

c) For the other projects, the Committee was of the opinion that, since the pattern they were adopting is the one outlined by the U.K. Mission report, it would be advisable to ask some of the technical experts of the U.K. Mission to draw out detailed specifications in consultation with Indian experts to be appointed by Government, for the heavy structural and heavy plate and vessel projects. When these specifications are received, global tenders should be invited for the supply of equipment and these tenders could then be examined by a Committee of Technical Experts from the private industries and the Government.

d) In regard to heavy machine tool manufacturing works, Mr. Jang Bir Singh suggested that firms like Wagners who have wide experience of the potential market conditions in India would be able not only to give a detailed project report but also would be in a position to suggest which are the specific items of Heavy Machine Tools with ranges, sizes and capacities, the manufacture of which could be undertaken usefully. These proposals could then be examined by a Committee of Experts from private industries and the Government.

e) In regard to the plant for the manufacture of mining machinery, there were two steps suggested by Mr. Jha, which were accepted by the Committee.

- (1) Since the Russians have gone into greater details and have prepared a separate report, it would be worth while having further negotiations with them in order to cut down the suggested annual output of 30,000 tons to a lower level, so as to accommodate it within the investment of 4.5 crores proposed by the Committee including its own forge-foundry shop. This method of approach would be exactly similar to the earlier approach made by the Ministry in regard to the project of heavy machine building where the annual output was reduced from 80,000 tons (Stage II) to 45,000 tons (Stage I) and ultimately brought down to 22,000 tons.
- (2) Since the U.K. Mission in its report had also recommended installation of mining machinery manufacturing plant, it would be worth while to ask them to prepare detailed specification exactly on the same pattern as for the structural and plate and vessel shop and within the financial limit of Rs.4.5 crores including its own forge-foundry shop.

Both these steps could be taken simultaneously and final decision taken when detailed project reports are received, on the recommendation of a Committee to be appointed of experts from the Coal Mining Industry and the Government after which global tenders should be invited.

Sir Jehangir thanked all the members of the Committee and stated that he would submit a report to the Government embodying the recommendations of the Heavy Engineering Committee, from Jamshedpur in about a week's time.

(K.Krishnaswami)